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## (54) Multi-cavity dispensing container.

(57) A rigid piston-type multi-cavity dispensing container for equal, simultaneous coextrusion of two or more flowable materials (8,9), such as multi-component toothpaste which, upon relative compression of the upper (2) and lower (12) body members, produces a single, unmixed stream of material. As the separate materials emerge from the end of the nozzle, a tapered septum acts to guide the distinct streams into a single, unmixed stream for easy application upon a toothbrush surface.

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# MULTI-CAVITY DISPENSING CONTAINER

## Background of the Invention

The present invention relates to a rigid telescopically arranged multi-cavity dispensing container for a flowable material, such as toothpaste, from which it is desired to dispense simultaneously two or more reactive substances which require separate storage until time of use.

## Prior Art

There exists a desire to provide sodium bicarbonate and peroxide gel as components of toothpaste. Sodium bicarbonate is a well known and commonly used abrasive and cleaner. Peroxide gel is regarded as a beneficial ingredient to help promote healthy gums. These components are reactive when mixed, and therefore must be maintained separately until time of use.

US Patent No 4 742 940 to Wilkinson discloses a basic single cavity dispenser. A hollow upper cylinder filled with a single flowable material has a dispensing spout but is otherwise closed at is upper end. A piston is arranged for telescopic upward movement within the upper cylinder so as to force a stream of flowable material through the spout upon relative compression of the piston and cylinder.

US Patent No 4 747 517 to Hart discloses a single cavity container for simultaneously dispensing increments of two extrudable materials that polymerise when mixed. The two materials are separated by an extrudable barrier layer which prevents intermixing of the materials until after they emerge from the outlet. A piston slidably mounted within the cavity acts to force the materials through a specially-adapted mixing nozzle so that the materials emerge in an already-mixed state. The nozzle must then be removed and replaced after each use because of the trapped epoxy mixture which later hardens and clogs the passageway.

US Patent No 3 166 221 to Nielsen discloses a rigid piston-type, double-tube dispensing container with a rigid barrier separating the two compartments. When the tube member is pushed down into the housing member, the contents will be pressed out through two separate nozzles. The contents emerge in the shape of two separate but closely juxtaposed bands which are difficult to dispense onto the narrow width of a toothbrush.

US Patent No 4 687 663 to Schaeffer discloses various configurations for simultaneously dispensing hydrogen peroxide and sodium bicarbonate. A rigid pump-type dual-cavity dispenser has two closely-positioned but separate outlets producing a double material stream which is difficult to apply to the narrow width of a toothbrush surface. Also disclosed is a collapsible tube separated into two compartments by a divider which extends to the rim of the mouth. Such an embodiment fails to take into account the possibility that the two components might have different rheologies, which will result in unequal quantities of the two materials being dispensed when the tube is squeezed.

It is thus an object of the present invention to provide a rigid piston-type multi-cavity dispensing container for simultaneous coextrusion of two or more flowable materials, which may have different rheologies, such as two components of a toothpaste and the like which, upon relative compression of the upper and lower body members, produces a single, banded, unmixed stream of material that can be neatly and easily applied onto the narrow width of a toothbrush.

It is a further object to provide such a container in which segregation of the component materials within the container is maintained both prior to and after dispensing without the requirement of an extra step such as replacement of the nozzle.

## Summary of the Invention

Accordingly, a unique nozzle is provided wherein a rigid barrier separating dispensing channels connected to the two cavities extends slightly past the nozzle opening in the shape of a flat tapered septum. The septum maintains the segregation of the two materials as they move simultaneously outward through the nozzle. As the separate materials emerge from the end of the nozzle, the tapered septum acts to guide the distinct streams into a single, banded, unmixed stream for easy application upon a toothbrush surface.

For a better understanding of the present invention together with other and further objects, reference is made to the following description, taken in conjunction with the accompanying drawings.

## Brief Description of the Drawings

Figure 1 is an exploded projection view of a syringe-type dual-cavity embodiment of the invention.

Figure 2 is an exploded projection view of a pump-type dual-cavity embodiment of the invention.

Figure 3 is a frontal cross-sectional view of

the embodiment of Figure 1.

Figure 4 is a side cross-sectional view of the sleeve portion of the embodiment of Figure 1.

Figure 5 is a projection view of the nozzle housing of the embodiment of Figure 2.

Figure 6 is a lengthwise cross-sectional view of the Figure 5 nozzle housing.

Figures 7A, 7B and 7C are the top, side and frontal views, respectively, of the key used with the Figure 2 embodiment.

Figure 8 is a frontal view of the locking mechanism portion of the embodiment of Figure 2.

Figure 9 is a projection view of the base portion of the Figure 2 embodiment showing the piston head.

Figure 10 is a vertical cross-sectional view of the Figure 9 piston head.

Figure 11 is a cross-sectional view of a striping mechanism useful with the embodiment of Figure 1.

Figure 12A is a partial cutaway frontal view of a striping nozzle.

Figure 12B is a side cross-sectional view of the striping nozzle of Figure 12A.

Figure 13 is a top view of a cap and nozzle arrangement for a dual-cavity embodiment of the invention.

Figure 14 is a side cross-sectional view of the nozzle arrangement of Figure 13.

Figure 15 is an exploded projection view of a pump-type three-cavity embodiment of the invention.

## Detailed Description

One embodiment of a device according to the invention will first be described as a "syringe version" for dispensing two materials, with reference to Figures 1, 3 and 4. A rigid sleeve 2 has two parallel hollow cylinders 4 separated by a rigid barrier 6. The two cylinders 4 each contain one of two reactive flowable materials 8, 9. The sleeve 2 is open at its bottom 10 to telescopically and slidingly accommodate a pair of parallel pistons 12 which conform to ride sealingly within the inner walls 14 of the cylinders 4. The pistons 12 are fixed to a multi-function base 15 which provides leverage for hand dispensing and which permits the device to stand upright when not in use. Furthermore, the base rigidly retains the pistons so as to provide for the smooth, equal and simultaneous movement of the two pistons into the cylinders during operation. The piston heads 16 should substantially conform to the shape of the upper closed portion 18 of the sleeve 2 so as to efficiently dispense the entire contents 8, 9 of the package. To accomplish this, the heads 16 may be of a hemispherical or other rounded shape. In the embodiment illustrated the piston heads 16 are fabricated of a pliable material and include sealing rings 17 which press against he cylinder walls to provide a seal. A lower cylindrical extension 19 is received into the hollow end of each piston 12.

The closed upper end 18 of the sleeve 2 has a cylindrical dispensing outlet passage 20 located diametrically above the barrier 6. The outlet passage 20 has two passageways, each of which connects to one of the two hollow cylinders 4 containing the materials 8, 9. Upon relative compression of the sleeve 2 and piston portion 12, the materials 8, 9 will flow into the respective passageways of outlet passage 20. The outlet passage 20 is arranged to receive a separate nozzle 30, which together comprise the outlet means 21.

The outlet passage 20 is bisected by a flat rigid septum 22 extending from the barrier 6 and sitting fixedly within the inner walls of the outlet passage 20. The septum 22 is tapered 24 cross-sectionally and ends in a straight edge 26. The cross-section of the septum edge 26 is a sharp angle approximated by a very small radius. The sides of the septum are preferably textured, for example by vapour honing, to a dull finish to promote adherence of the products thereto, which together with the taper 24 causes the product streams to converge into a single stream at the outlet of nozzle 30.

The septum 22 of this unique nozzle design acts to keep the two reactive materials 8, 9 separate as they emerge from the cylinders 4 and also prevents reaction and obstruction of the outlet means 21 by reaction products. The materials 8, 9 converge as they flow through the outlet means 21, but the two streams do not meet until they have fully left the outlet means opening 32. The taper design of the septum 22 permits the two streams 8, 9 to gradually converge until they meet at the septum edge 26 beyond the end of the outlet means opening 32. At this point, they smoothly touch and continue to flow onto the intended surface, eg toothbrush, as a single, substantially cylindrical, two-banded stream. This single stream is convenient and easy to direct with accuracy upon a limited surface area.

The diameter of the emerging single stream may be regulated according to packaging specifications. For example, nozzle 30 which snaps on around the outlet passage 20 may be provided. Nozzle 30 has an interior taper which reduces the effective outlet passage diameter as shown in Figure 4. In such an embodiment, the length of the exposed portion of the septum edge 26 is reduced accordingly so as to confirm to the converging inner shape 35 of the nozzle 30.

With reference to Figures 13 and 14, nozzle 30 is provided with longitudinal grooves 37 along its

converging inner wall for retaining the inward sloping sides 35 of the septum 22 residing therein. Such an arrangement maintains the septum 22 in a rigid position within the outlet means 21 and prevents intermixing of the streams at contact points of the assembled septum 22 and outlet means 21. The septum 22 extends to a location preferably 0.1-0.3 mm beyond the outlet means opening 32.

The nozzle 30 preferably has a cap 34 connected thereto by a hinge 33. Cap 34 includes a complementary engaging means comprising recesses 31a and 26a for receiving respectively nozzle rim 31 and septum edge 26 during closure, so that intermixing of the two substances 8, 9 is prevented once the cap is closed.

Another embodiment of the device, shown in Figure 2 in a dual-cavity arrangement, include upper sleeve 85 and lower sleeve 86 telescopically engagable for relative compression by a single force exerted down on the top against the ground surface supporting an anti-rocking base 87. This "pump version" also has a nozzle assembly 42, shown in Figure 5 and 6, which provides for a forward facing dispensing nozzle. Two hollow cylinders within upper sleeve 85 have outlet passages that extend through a perpendicular bend into two separate forward facing tubes 40 of reduced diameter. An outlet assembly 42 is fitted about the tubes 40 and converges so as to end in an outlet passage 20 with two passageways as described above. The tubes 40 receive tube sleeves 41 of the outlet assembly 42. As the tube sleeves 41 converge within the outlet assembly 42, they form a common rigid barrier which extends through the outlet means 21 as a septum 22, described above. A nozzle 30 may also be provided as described above to additionally comprise the outlet means 21.

The shrouds 85, 86 of the pump version may possess guide means 91, 93 on either of two opposing sides comprising longitudinal, outward, rectangular extensions of the shrouds 85, 86, one of which guide means 91, 93 rides within the other during relative compression of the sleeves. The guide means prevent rocking of one sleeve within another and consequent uneven relative motion of the two pistons. Therefore, materials 8, 9 of differing rheologies may be evenly dispensed. It is understood that the guide means may be of any acceptable shape and comprise a plurality of extensions, both inward and outward. In addition to providing guided relative motion of the shrouds, the extensions improve the mechanical rigidity of the shrouds.

Further embodiments of both the syringe and pump versions of the device may employ a reversed piston orientation wherein the pistons are mounted together with the outlet passages (upper portion) and the flowable materials are found in separate cylinders of the lower portion. As relative compression of the upper and lower portions takes place, the materials are forced upward through separate paths formed within the upper portion.

Additional embodiments of both versions may also possess a striping feature, whereby, eg colour or flavour additives, or functional ingredients are imparted to each stream as it passes through the outlet means 21. For the syringe version, as shown in Figure 11, an amount of striping fluid 108, 109 is contained near the upper closed portion 18 of each cylinder 4. A striping fluid retaining area 112 is defined by the upper closed portion 18 of each cylinder 4 and by an extension 120 into each cylinder 4 of the outlet passage 20. As the contents 8, 9 are forced towards the upper closed portion 18 during use, they will pass through the outlet passage 20, as indicated by the arrows "X". The contents 8, 9 will at the same time apply force against the striping fluids 108, 109 as indicated by the arrows "Z". Under this force, the striping fluids 108, 109 will be forced as shown by arrows "Y" through one or more relatively small orifices 114 interconnecting the retaining area 112 and the outlet passage 20. Thus, upon compression of the device, amounts of striping fluid 108, 109 will enter the respective outflowing streams 8, 9. Additionally, the striping feature may be imparted by a striping nozzle, shown in Figures 12A and 12B. The striping nozzle 130 is fitted about the outlet passage 20 in similar fashion to the nozzle 30 described above, and operates as does the above-described striping feature. Striping fluids 108, 109 are located in retaining areas 112 within the striping nozzle 130. Amounts of the fluids 108, 109 are picked up by and carried along with the outgoing streams 8, 9 via contact at one or more communicative orifices 114.

It is easily seen that the device may also be extended to simultaneously dispense more than two materials by providing an increased number of parallel hollow cylinders and corresponding number of pistons. The nozzle may be appropriately subdivided by a multiple tapered septum extending to the nozzle walls from a central point. Figure 15 shows a three-cavity dispenser. The outlet passage 220 is trisected by the septum 222. Of course, the above descriptions to a recessed cap 34 and recesses on the inner walls of nozzle 30 may be easily adapted to a tripartite or multipartite septum.

The dispenser may further possess an improved piston head, shown in Figures 9 and 10, which is characterised by its simplicity and ease of assembly. The piston head 16a has an exterior shell 52 of a flexible material such as soft plastic or the like. The shell has a circumferential wiping surface 54 for bearing against the inner walls 14 of the cylinders 4. A cylindrical plug 58 is mounted

within the shell 52, the plug 58 having an enlarged rib 60 which enters bore 64 formed on the end 62 of the piston 12. The cylindrical plug 58 supports the piston head 16a against removal from piston 12. An intermediate cylindrical member 66 surrounds projecting piston end 62 and supports piston head 16a against the piston end 62. The intermediate cylindrical member 66 acts to push the shell 52 along with the piston 12 when the piston is pushed into the cylinder 4 during operation of the dispenser.

An embodiment of the pump version of the device may additionally contain a locking mechanism, shown in Figures 7 and 8, which prevents unwanted relative compression of the shall and pistons during shipping and at other times before first use is desired. A key 70, shown in Figures 7A, 7B and 7C comprises a rod 72 of rectangular cross-section, which at its end 74 has at least one of opposing sides 76, 79 sloping upward 77, 75 to form an enlarged end 78 of partial circular cross-section. As shown in Figure 2, before assembly of the device, the key 70 is inserted through through parallel longitudinal slots 80 in the front and back faces of the upper sleeve 85. The key 84 is then rotated so that the round sides 71a of the end face 78, which are wider apart than the width of the slots 80, prevent it from being pulled outward from the upper sleeve 85. When the device is assembled, the upper sleeve 85 is telescopically placed into a rigid lower sleeve 86 which fixedly houses the pistons 12 therein. The rod 72 abuts the upper end 88 of the lower sleeve 86, and is retained above by a stop 82 formed by the end of the slots 80. Thus, further relative movement of the sleeves 85 and 86 is prevented. When first use is desired, the key may be rotated so that the straight sides 71b of the end face 78 line up with the edges of the slot. The key 84 is then pulled outward and compression of the device is permitted. Using greater force the key may be removed without rotation.

## Claims

1. A multi-cavity dispensing container for the coextrusion of at least two flowable materials, comprising a dispensing container comprising at least two hollow and separate parallel cylinders (4), each having a first generally closed end (18) and a second open end (10) to telescopically and slidingly accommodate two parallel pistons (12) so as to force said flowable materials to flow toward said first end of said cylinder upon relative compression of the cylinders and pistons, said cylinders having outlet channels and an outlet means (20) in fluid communication with said outlet channels, wherein said outlet means is bisected by a flat tapered septum (22) extending from said outlet channels and extending to or beyond the end of said outlet means.

2. A dispensing container as claimed in claim 1 wherein the cross-section of the septum edge (26) approaches a sharp angle of very small radius.

3. A dispensing container as claimed in claim 1 or claim 2, wherein said tapered septum (22) is textured so as to possess a dull finish.

4. A dispensing container as claimed in any one of claims 1 to 3, wherein said outlet means comprises a nozzle member (30) having interior longitudinal grooves (37) for receiving the side edges of said septum (26) so as to retain the septum in a rigid state and to prevent cross-mixing of the materials within the outlet means.

5. A dispensing container as claimed in claim 4, wherein said outlet means has attached thereto a hinged cap member (34), wherein said cap member has conforming recesses (31a, 26a) for receiving the outlet end of said nozzle (31) and said septum edge (26) upon closure of the cap member.

6. A dispensing container as claimed in any one of the preceding claims comprising a first shroud (85) surrounding said cylinders and a second shroud connected to and surrounding said pistons (86), said first shroud being arranged to closely conform in sliding relation within said second shroud, whereby relative motion between said shrouds is constrained to be substantially linear so as to provide equal linear motion of said pistons into said cylinders.

7. A dispensing container as claimed in any one of the preceding claims further comprising a means for adding at least one striping material (108) to one or more of the flowable materials as said materials flow through said outlet means.

8. A dispensing container as claimed in any one of the preceding claims wherein the container comprises multiple cylinders arranged on a first member and multiple pistons arranged on a second member for being received in said cylinders, comprising a locking means (72) for preventing relative compression of said first and second members.

9. A method for extruding a single unified stream of at least two incompatible flowable materials, comprising:

(a) storing said materials in at least two cylinders having at least two movable pistons (12) and outlets (20) communicating with the interior of said cylinders;

(b) moving said pistons at proportional rates into said cylinders to force said materials through said outlets;

(c) and providing a septum (22) between

said outlets arranged to cause said materials to flow toward each other through said outlets, whereby said materials flow into a single unified stream at the end of said septum.

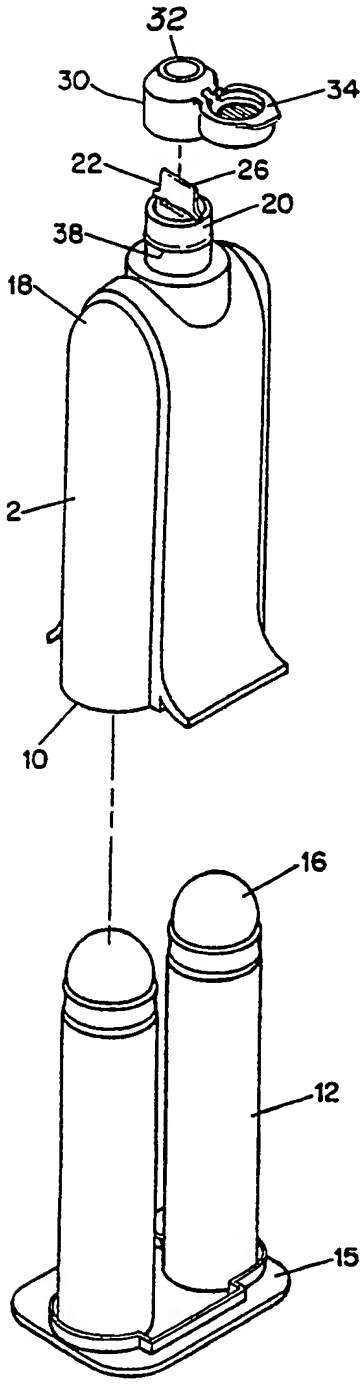
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FIG. 1

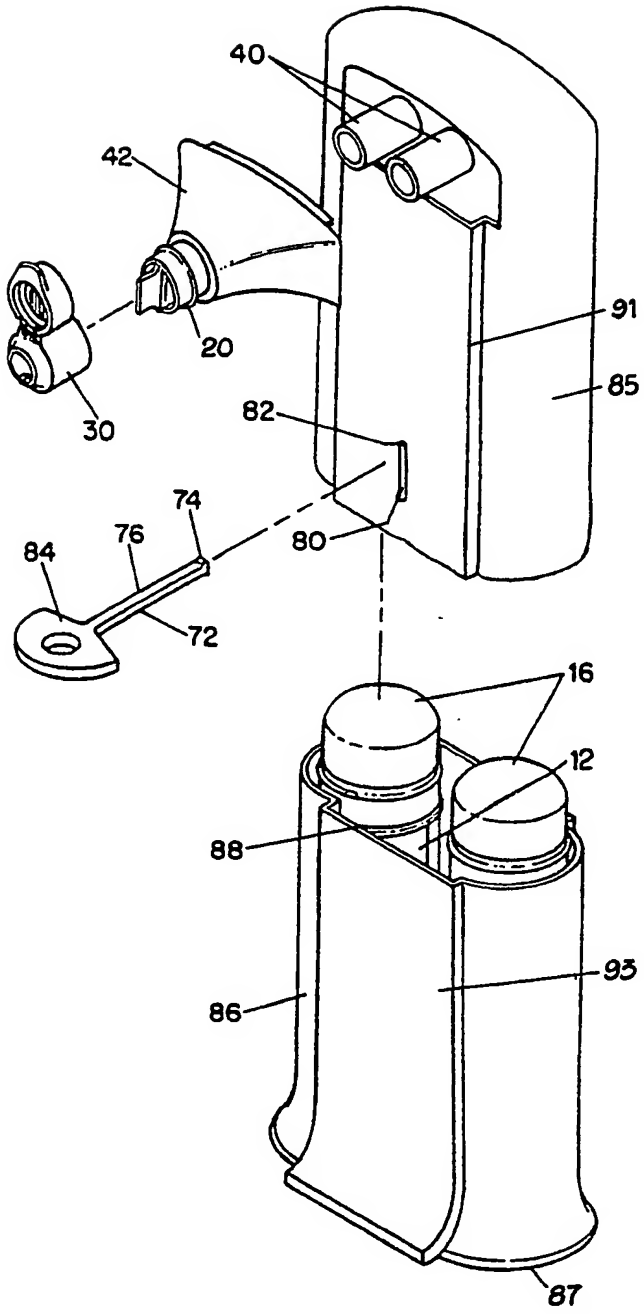
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FIG. 2

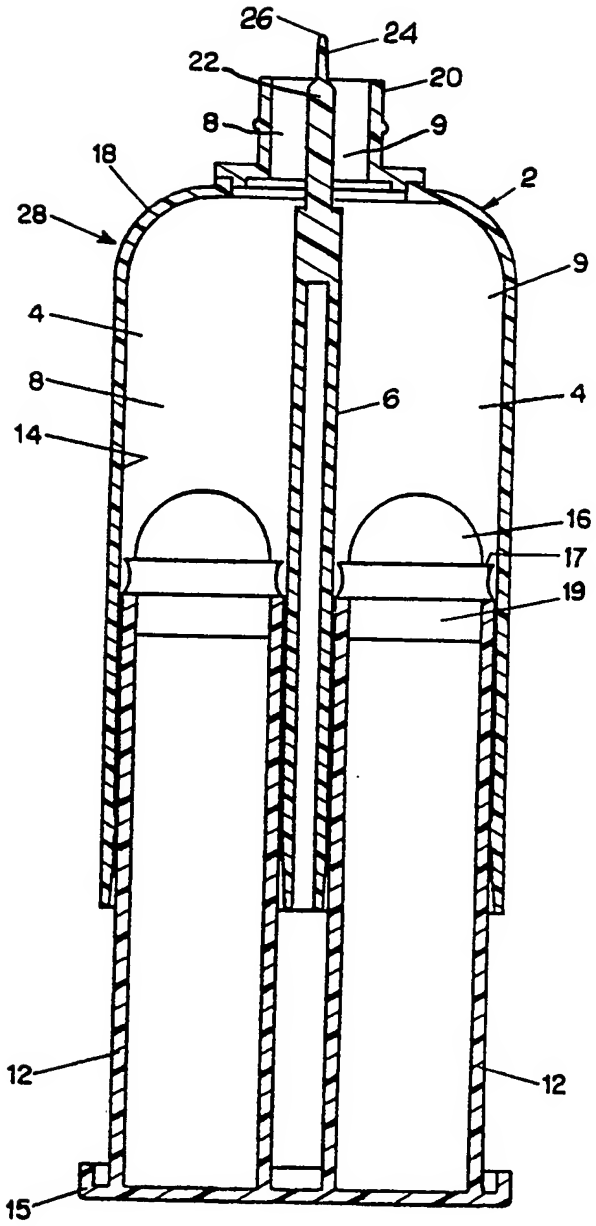
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FIG. 3

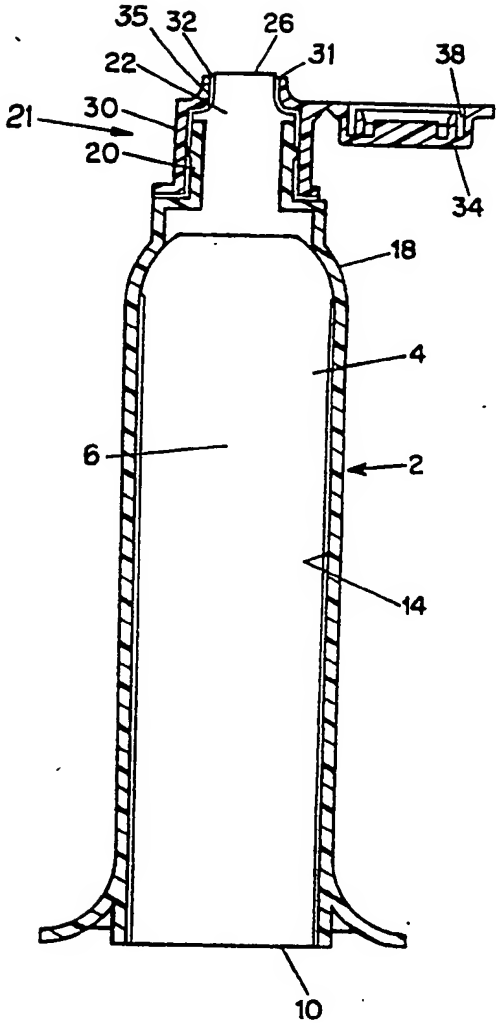
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FIG. 4

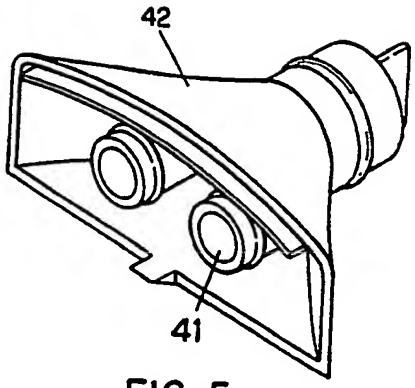


FIG. 5

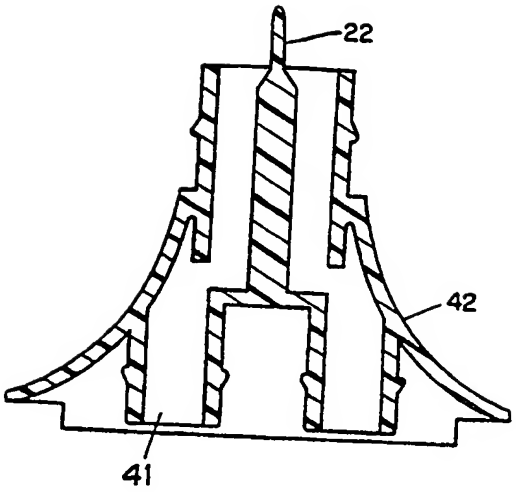


FIG. 6

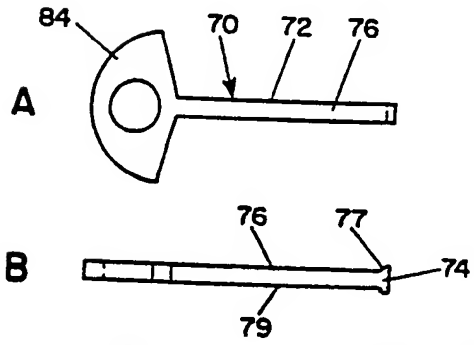


FIG. 7

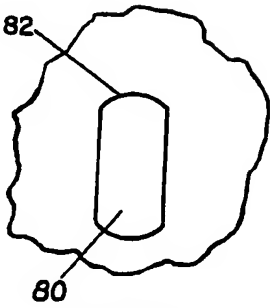


FIG. 8

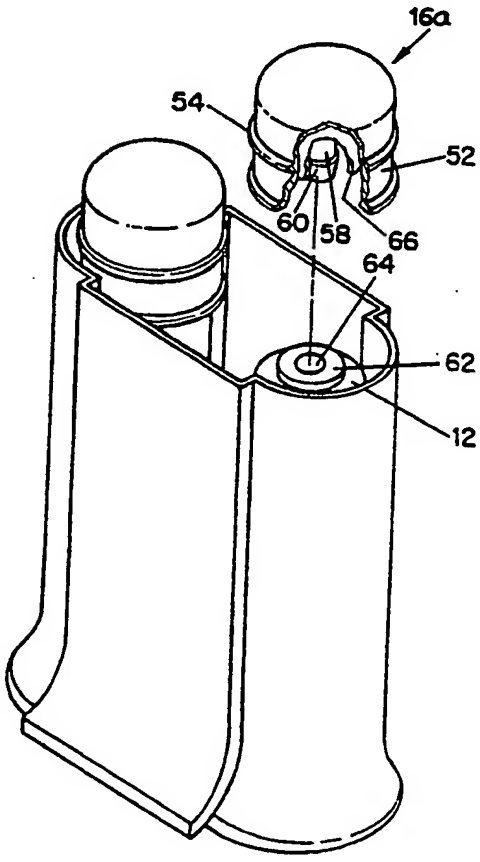


FIG. 9

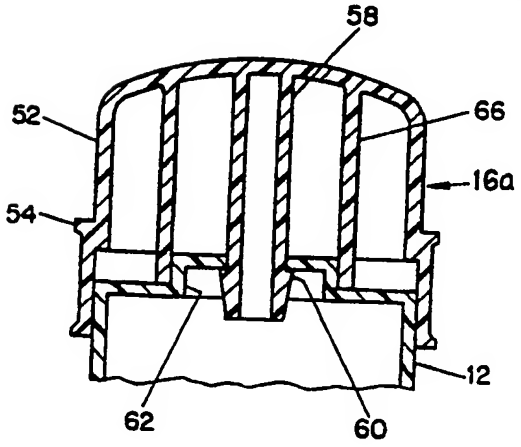


FIG. 10

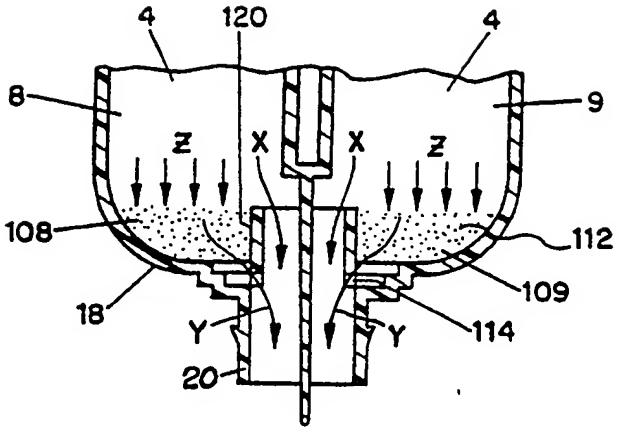


FIG. 11

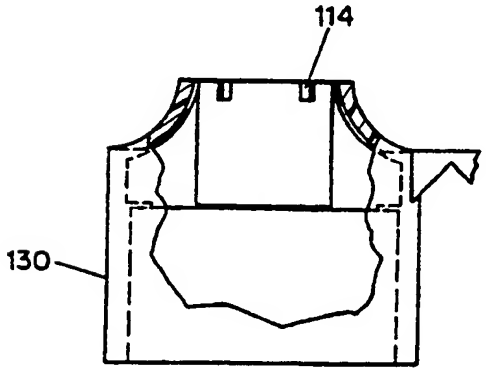


FIG. 12A

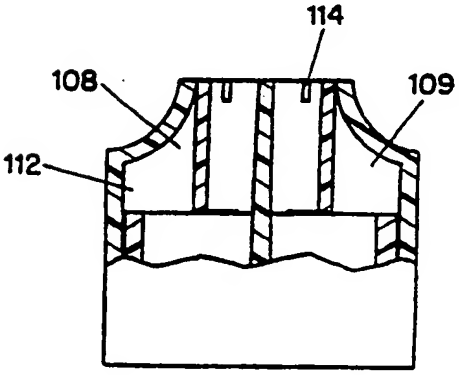


FIG. 12B

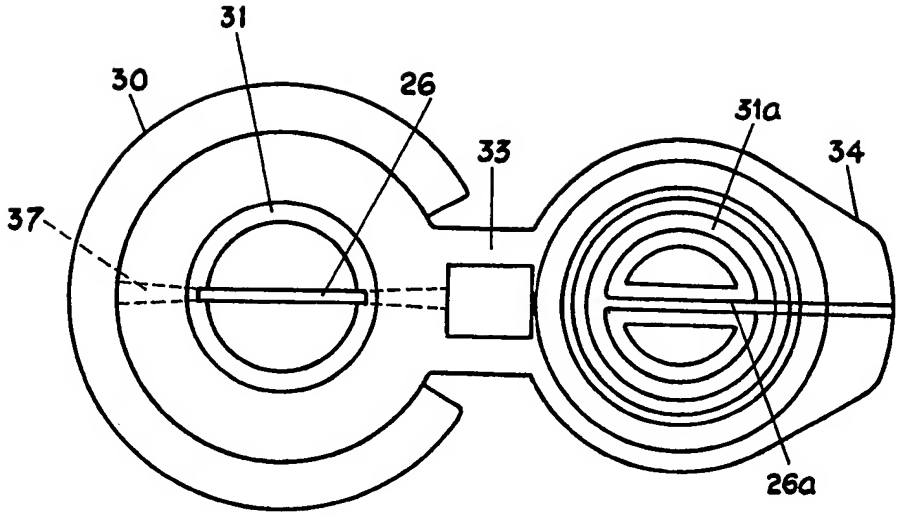


FIG. 13

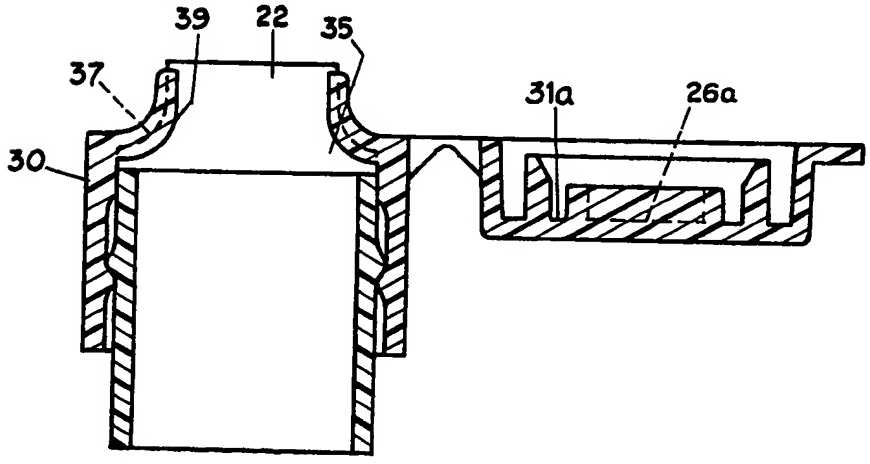


FIG. 14

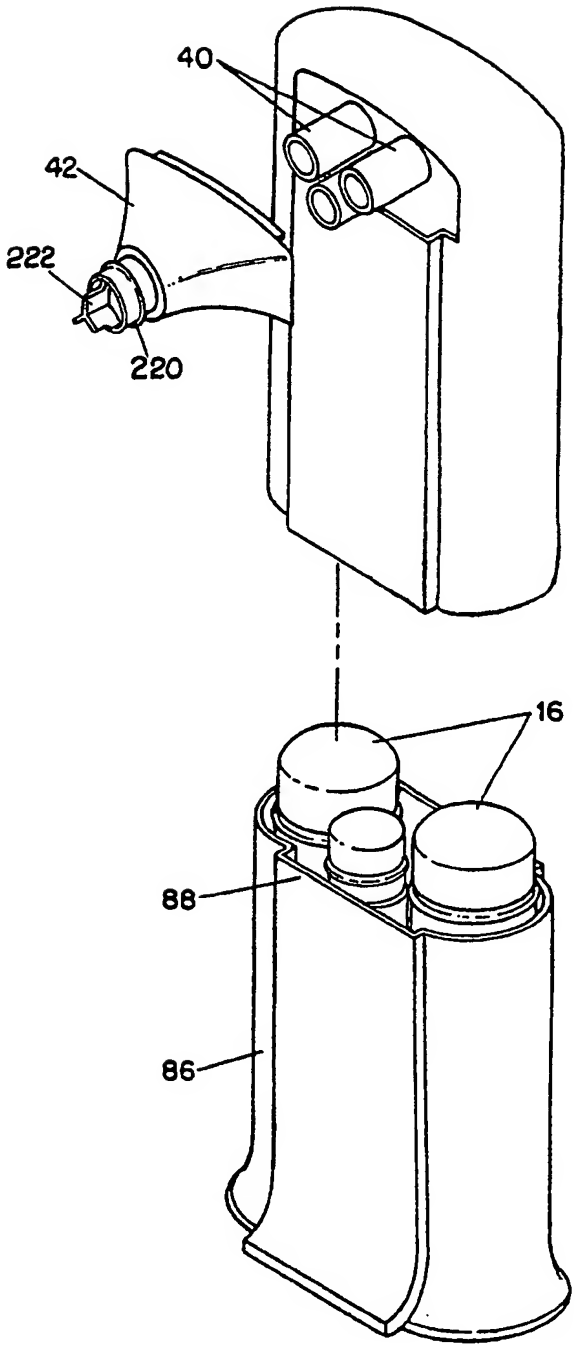


FIG. 15

European Patent Office

# EUROPEAN SEARCH REPORT

Application Number

EP 90 30 2728

## DOCUMENTS CONSIDERED TO BE RELEVANT

| Category | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim | CLASSIFICATION OF THE APPLICATION (Int. Cl.5) |
|---|---|---|---|
| X | EP-A-0 294 672 (W.A. KELLER)<br>* Figures 1,3,5; column 3, line 58 - column 4, line 58; column 6, lines 11-20 * | 1,2,9 | B 65 D 81/32<br>B 65 D 83/00 |
| Y | | 6 | |
| Y | FR-A-2 095 844 (BEECHAM GROUP LTD)<br>* Figures 1-4; page 3, lines 3-40 * | 6 | |
| A | US-A-4 121 739 (W.D. DEVANEY)<br>* Figures 1,5; column 2, lines 18-55 * | 1,2,9 | |
| A | US-A-4 040 420 (S.J. SPEER)<br>* Figures 1,2; column 2, line 67 - column 3, line 30; column 4, line 59 - column 5, line 37 * | 1,2,9 | |

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

B 65 D
A 61 M

The present search report has been drawn up for all claims

| Place of search | Date of completion of the search | Examiner |
|---|---|---|
| THE HAGUE | 05-06-1990 | PERNICE,C. |

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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EPO FORM 1503 03.82 (P0401)